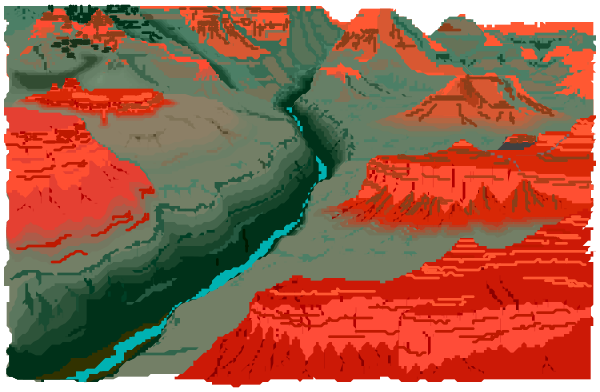
SOIL LAYERS AND GROUNDWATER

Objectives

Students will compare the difference in various soil types, analyze how infiltration changes with different soil types and describe the challenges of recharging a water table due to various rock types

Materials

- Four large paper (or plastic) cups
- 1 cup gravel
- 1 cup sand
- 1 cup topsoil
- 1 cup clay soil
- shallow pan
- food coloring
- quart of water
- stopwatch
- magnifying lens



Procedure

1. Discuss various rock and soil types found in the ground above the water table. Some examples are sand, silt, clay, gravel, limestone, sandstone, granite, etc. Realizing that there are many layers between the ground and the water, ask the students if it is easy for water to reach the water table. Predict which of the soil types will be the fastest and slowest for the water to travel through. Do you think these exist under the earth where you live?
2. Have the students examine each type of soil. Have them rub a pinch between their fingers. What do they feel like? What do they smell like? Investigate each under the magnifying lens. How large is a particle of each one? A sand particle is about 0.4 mm clay is about 0.004mm per particle. Which would hold more water between the particles? Which would hold the least?
3. Punch four small holes in each cup and fill each cup with one type of soil material.
4. Place about 4 drops of food coloring in the quart jar of water. Place ½ cup of colored water into the measuring cup.
5. Have one of the students get ready with a stopwatch to time the procedure. Hold one of the cups over the pan and pour ¼ cup of the colored water into the cup. Time how long it takes the first colored water to reach the pan. Measure the water that collected in the pan. Record your information.
6. Repeat procedure for all four cups.
7. Which one took the longest? Which type returned the most water to the pan below? Why?
8. When does water enter the soil? What happens when water moves through soil layers? Is this an easy path for water to take? Can water move through all types of layers? Why or why not? What would happen if the water were to intercept a cave?

9. Can the soil layers clean the water? Do various soil types have cleaning qualities? How? (Bacteria, sediment and other insoluble forms of contamination get trapped in the soil pores; some chemicals are absorbed or react with the soil and are prevented from entering the groundwater; plants and soils use potential pollutants like nitrogen as nutrients decreasing the amount that gets into the water.)
10. Which type of soil would be most efficient at clean water? What events on the surface could cause the water to need to be cleaned? What happens if these contaminants get into a cave?
11. Recharge rates of water tables depends on the amount and rate of water moving through the surface, soil, and rocks beneath. Which is better – a fast rate of recharge or a slow one? Why? Would water be more contaminated with faster recharge or slower? What is the benefit of having a slower recharge rate? A faster rate? How will an aquifer fill if there is a lot of water was being removed quickly and the recharge is slow? In real life, how do people balance these issues?